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CLAMPING FORCE DURABILITY TEST

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ELIOT LAKE LABORATORY

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CLAMPING FORCE DURABILITY TEST

by

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ABSTRACT

An investigation was conducted on the clamping force durability of the new generation "No-Noise" ear muffs which are commonly used in Ontario mines. An inexpensive method, using a shaper with a small counter was used to flex the ear muffs in a back and forth direction. Results indicated no failure in any of the three ear muffs tested. The new generation ear muffs are more suitable since the clamping force remains constant after long use, (a minimum two to three year period). The simplicity of this test makes it easy to repeat in the mining industry.

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ESSAIS SUR LA DURABILITÉ DES SERRE-TÊTE ANTIBRUIT

par

K.C. Butler* et M.U. Savich**

RÉSUMÉ

Des essais ont été effectués pour déterminer combien de temps les nouveaux serre-tête antibruit qui sont couramment utilisés dans les mines d'Ontario conservent leur force de serrage. La méthode d'évaluation, peu coûteuse, consistait simplement à faire subir un mouvement de va-et-vient au serre-tête, en l'enserrant dans un étau muni d'un petit compteur. Aucun défaut n'a été décelé dans les trois serre-tête à l'étude. Cette nouvelle génération de serre-tête répond mieux aux besoins, étant donné que la force de serrage demeure constante, même après une longue utilisation (soit un minimum de deux à trois ans). Ce genre d'essai très simple peut être facilement repris par l'industrie minière.

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INTRODUCTION

In Ontario mines, the "No-Noise" ear muff manufactured by Hellberg Protection AB of Gothenburg, Sweden, is commonly used (Fig. 1). This type of ear muff was investigated by several authors, and unsatisfactory attenuation was found to occur (1-4). Even though these ear muffs had poor attenuation, they were very popular in mines, mainly for two reasons: light weight and low price. The poor attenuation of this type of ear muff was in connection with weak clamping force. Old generation ear muffs used a metal arm for clamping force, which in many cases became bent and lost tension resulting in reduced efficiency. Hellberg Protection Company recognized this problem and introduced a new type of ear muff to the market (Fig. 2). The two main differences between the old generation and new generation ear muff are the larger volume cup and significant improvements in clamping force.

The block connector of a new generation ear muff was taken apart for

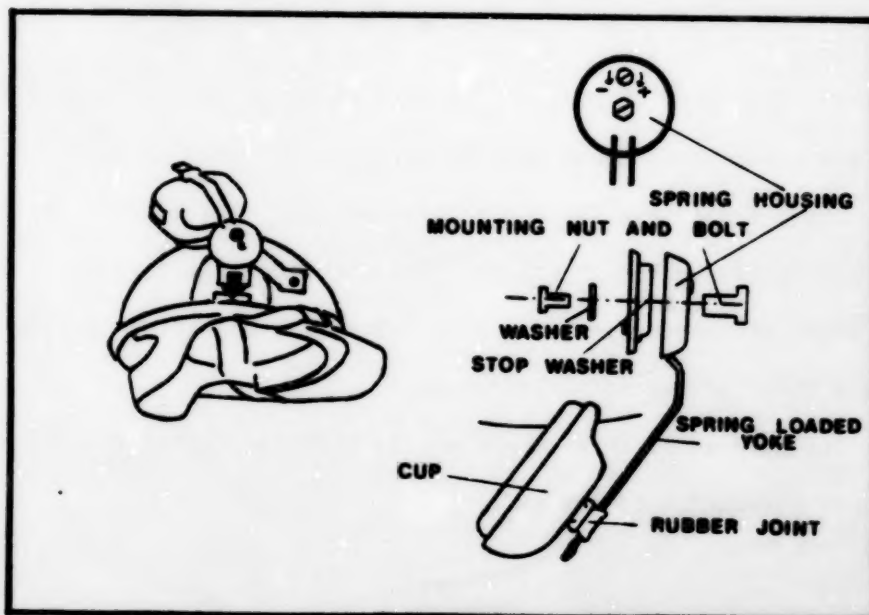


Fig. 1 - Old generation "No-Noise" ear muff,
Hellberg Protection AB, Gothenburg.

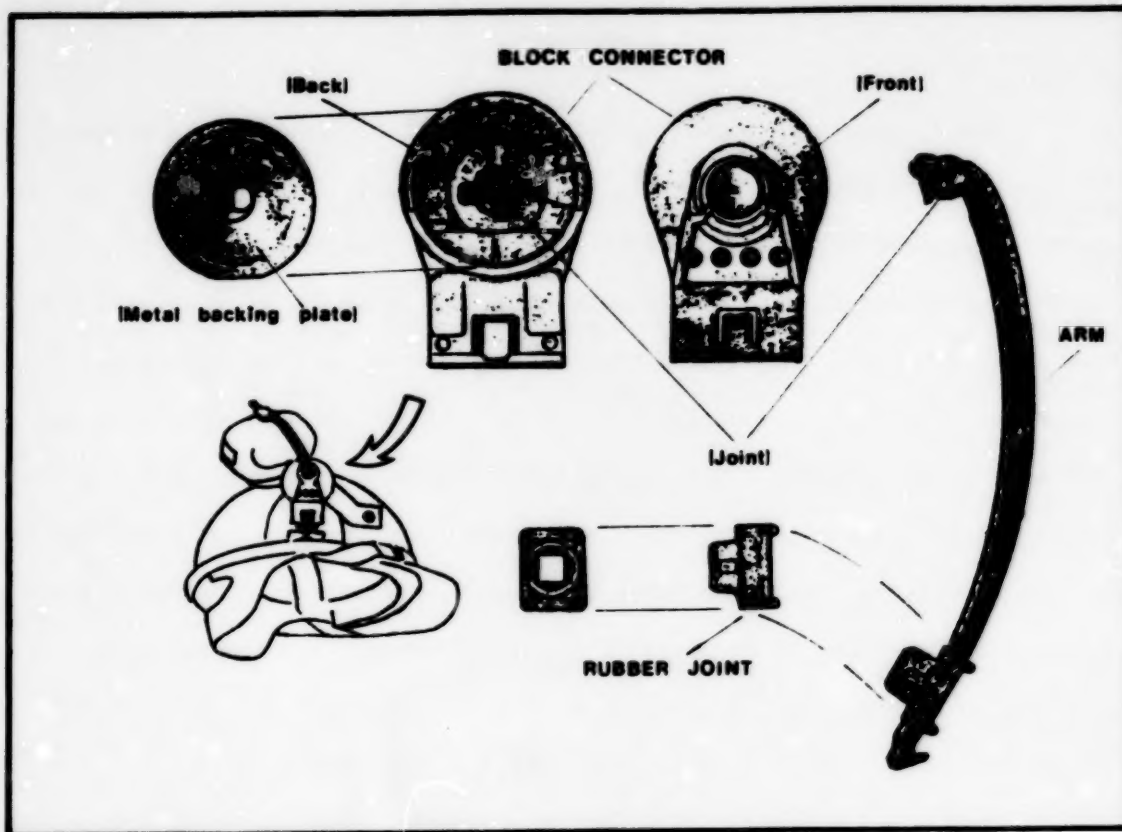


Fig. 2 - New generation "No-Noise" ear muff,
Hellberg Protection AB, Gothenburg.

inspection. This part of the muff is very simple with only two moving parts; the arm and a tensioned metal backing plate.

The ear muff arm is manufactured of very hard durable solid plastic with no reinforcing material inside. This provides rigidity with little fatigue after prolonged flexing. Also, wear at the joint is further minimized by using a light grease for lubrication.

The purpose of this study was to test the clamping force durability of this new generation of ear muff.

TEST

The power source used to flex the ear muffs was a 26 inch Standard

Crank Shaper manufactured by Canada Machinery Corporation of Cambridge, Ontario (Fig. 3). The stroke length of the muf was adjusted to 8.25 cm (3 $\frac{1}{4}$ in). This stroke length approximates the distance an ear muf is moved from its position on the wearers' ears to its resting place on the hard hat and vice versa. The number of strokes of the muf was recorded using a small, inexpensive hand held counter (~ \$10.00), attached to a magnetic base indicator holder. The counter was positioned directly in front of the shaper lathe head and upon each forward stroke of the ram, as the ear muf was flexed, a pencil (rubber pin) fastened to the head of the ram would gently strike the push button of the counter. For each recorded count the ear muf moved through one inner and one outer stroke. The safety hat was fastened to a sheet of plywood (30 cm x 35 cm), which in turn was attached to the side of the shaper lathe table. The ram head tool holder had a "paddle" shaped board attached to it which was positioned against the inner cushion of the ear muf and attached to the base of this board was a steel band with a 1 cm wide strip cut in the middle. This band was wrapped around the outer surface of the ear muf. Its purpose was to secure and pull the muf on each forward stroke of the ram.

RESULTS

A total of six muffs were to be tested (Table 1). The stroke speed of the shaper lathe was adjusted to approximately 17 counts per minute, and at each 50 count interval the shaper lathe was stopped and the block connector and arm were inspected for any failure. After 300 counts, the inspection interval was increased to 100 counts. Upon reaching 3,800 counts a time interval was now adopted, using ten minute periods in which the shaper lathe was stopped and the muf was inspected. At the 10,000 count point, the stroke

-TESTS WERE CONDUCTED ON
26" STANDARD CRANK SHAPER-

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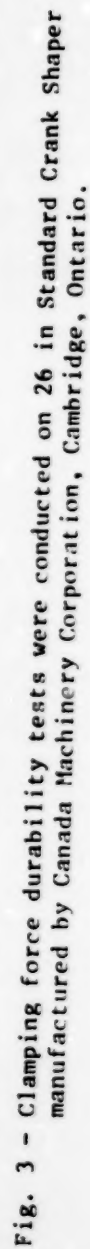


Table 1 - Clamping force durability test.

"No-Noise" Ear Muff	Number of Counts
1	15,000
2	Not tested
3	15,000
4	Not tested
5	15,000
6	Not tested

speed was increased to approximately 25 counts per minute with an inspection every ten minutes. After 15,000 counts, testing on ear muff No. 1 was stopped. Testing was started on ear muff No. 3 at a stroke speed of 25 counts per minute and an inspection every ten minutes. After 9,500 counts the stroke speed was increased to approximately 53 counts per minute. After 15,000 counts testing was stopped without any failure. Ear muff No. 5 was now substituted and tested at a stroke speed of 53 counts per minute up to 15,000 counts. Since none of the ear muffs had failed and there was no observable wear, it was decided that further testing of the remaining three (3) ear muffs was not warranted.

CONCLUSION

The clamping force durability of the new generation of "No-Noise" ear muffs has been tested and found to be very good. The old generation "No-Noise" ear muff had poor attenuation due to the small cup size and the design of the arm causing it to be easily bent by the wearer resulting in poor clamping force. The three new generation "No-Noise" ear muffs were all flexed to a 15,000 count without either the block connector or arm failing. Assuming a worker removes the ear muffs between 20 to 30 times per shift, the muffs

should last a minimum of two to three years. Since the clamping force pressure is not adjustable in the new generation "No-Noise" ear muff, this results in a more constant clamping force.

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